PATENT

I hereby certify that on the date specified below, this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to the Assistant Commissioner for Patents, 2011 Jefferson Davis Highway, Washington, DC 20231.

November 30, 2001 — Kelli Endreson

Date — Kelli Endreson

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Kyle M. Hanson, Robert A. Weaver, Jerry Simchuk and Raymon F. Thompson
Application No.	:	09/882,309 Confirmation No.: 7064
Filed	:	June 14, 2001
For	:	DIFFUSER WITH SPIRAL OPENING PATTERN FOR ELECTROPLATING REACTOR VESSEL

Examiner		Wesley Nicholas
Art Unit		1741
Docket No.		291958123US1
Date	:	October 4, 2001

Commissioner for Patents
Washington, DC 20231

DECLARATION OF KYLE M. HANSON UNDER 37 C.F.R. § 1.131

Dear Commissioner:

I, Kyle M. Hanson, declare and state that:

1. I am a joint inventor of the invention described and claimed in U.S. Patent Application No. 09/882,309 filed June 14, 2001, which is a continuation of U.S. Patent Application No. 09/351,864, now issued as U.S. Patent No. 6,254,742. This declaration establishes conception and reduction to practice of the invention in this country before May 29, 1998, and thus before the U.S. filing date of U.S. Patent No. 6,080,288 issued to Schwartz et al., and U.S. Patent No. 6,103,085 issued to Woo et al.

2. Before May 29, 1998, my co-inventors and I conceived the invention presented in claims 17, 26, 27, 28 and 37 (see enclosed Preliminary Amendment, filed herewith) of the above-captioned patent application. Our conception and reduction to practice of the invention are corroborated by (a) redacted drawings (attached to this Declaration as Exhibits A and B), and (b) redacted test results (attached to this Declaration as Exhibit C) corresponding to tests completed using a diffuser manufactured in accordance with one of the redacted drawings.

3. As shown in Exhibits A, B and C, my co-inventors and I conceived and reduced to practice an apparatus for processing a microelectronic workpiece and a method for using the apparatus. In one embodiment set forth in claim 17, the apparatus is for processing a microelectronic workpiece in a process chamber configured to contain a process fluid, with the process chamber having an electrode support configured to support an electrode at a first position within the process chamber, and a microelectronic workpiece support configured to support a microelectronic workpiece at a second position spaced apart from the first position. The apparatus includes a diffusion plate member configured to be positioned between the first position and the second position, with the diffusion plate member having a first surface facing toward the first position and a second surface facing toward the second position (see Exhibit A, drawings labeled ATG0230, ATG0231, and ATG0232). The diffusion plate member further includes a plurality of openings extending through the diffusion plate member from the first surface to the second surface, with the openings being arranged in at least one spiral pattern (see Exhibit B, drawings labeled ATG0230, ATG0231, and ATG0232, identical to the respective drawings of Exhibit A, with the exception of the addition of spiral lines sketched in by hand after the creation date of the drawings to highlight the spiral nature of the hole patterns). At least one of the diffusion plate member and the microelectronic workpiece support is rotatable relative to the other.

4. My co-inventors and I also conceived a further embodiment, set forth in claim 26, wherein the diffusion plate member of claim 17 is positioned in a process chamber configured to contain a process fluid, and wherein the process chamber has an electrode support configured to support an electrode at a first position, the process chamber further having a microelectronic workpiece support configured to support a

microelectronic workpiece at a second position spaced apart from the first position (Exhibit A, drawing labeled 100T0033).

5. My co-inventors and I also conceived of a further embodiment, set forth in claim 27, wherein the diffusion plate member is positioned in a process chamber, and wherein the process chamber includes a second vessel disposed inwardly from a first vessel, the second vessel having an upper edge defining a weir over which the process fluid flows into the first vessel, and wherein an electrode is disposed within the second vessel (Exhibit A, drawing labeled 100T0033).

6. My co-inventors and I conceived of still a further embodiment (set forth in claim 28) of a process chamber for processing a microelectronic workpiece that includes a first vessel (Exhibit A, drawing labeled 100T0033), and a second vessel disposed inwardly from the first vessel and configured to hold a process fluid, the second vessel having an upper edge defining a weir over which the process fluid can flow into the first vessel (Id.). The process chamber includes an electrode support configured to support an electrode at a first position within the second vessel (Id.) and a microelectronic workpiece support positioned proximate to the second vessel to support a microelectronic workpiece at a second position spaced apart from the first position (Id.). The process chamber still further includes a diffusion plate member positioned between the first position and the second position with the diffusion plate member having a first surface facing toward the first position, a second surface facing toward the second position, and a plurality of openings extending through the diffusion plate member from the first surface to the second surface with the openings being arranged in at least one spiral pattern, and with at least one of the diffusion plate member and the microelectronic workpiece support being rotatable relative to the other (Exhibits A and B, drawings labeled ATG0230, ATG0231, and ATG0232).

7. My co-inventors and I conceived of yet a further embodiment (set forth in claim 37) of a method for processing a microelectronic workpiece that includes disposing the microelectronic workpiece in a vessel (Exhibit A, drawing labeled 100T0033), positioning a first electrode proximate to the microelectronic workpiece (id.), coupling a second electrode to the microelectronic workpiece (id.), and disposing a diffusion plate member between the first electrode and the microelectronic workpiece

(id.). The method further includes directing a flow of processing fluid toward the microelectronic workpiece through a plurality of openings in the diffusion plate member, with the openings being arranged along a spiral path (Exhibits A and B, drawings labeled ATG0230, ATG0231, and ATG0232), and rotating at least one of the diffusion plate member and the microelectronic workpiece relative to the other while directing the flow of processing fluid through the openings in the diffusion plate member.

8. My co-inventors and I reduced the invention to practice by directing the fabrication of diffusion plate members in accordance with the foregoing claims and testing the diffusion plate members in a process chamber supporting a microelectronic workpiece. My co-inventors and I directed the fabrication of a diffusion plate member (generally similar to that shown in Exhibit A, drawing labeled ATG0232), installed the diffusion plate member in a processing chamber (generally similar to that shown in Exhibit A, drawing labeled 100T0033) and applied a conductive coating to a microelectronic workpiece in the processing chamber. We then measured the sheet resistance of the microelectronic workpiece plated in the processing chamber. We obtained raw data corresponding to sheet resistance values for 49 points on the conductive material applied to the microelectronic workpiece (Exhibit C, data sheet labeled Prometrix OmniMap RS30, 09:24). These data were interpolated to produce a matrix of 121 points (Exhibit C, data sheets labeled Prometrix OmniMap R530, 11:05. The interpolated data were used to produce a contour plot indicating sheet resistance over the surface of the microelectronic workpiece (Exhibit C, contour plot labeled Prometrix OmniMap R530, 09:37).

9. I further declare that all statements herein made of my own knowledge are true, and that all statements made on information or belief are believed to be true; and further, that the statements are made with the knowledge that the making of willful or false statements or the like is punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from this patent application.

Dated this 30 day of October, 2001.

Kyle M. Hanson

Residence	:	City of Kalispell State of Montana
Citizenship	:	United States
P.O. Address	:	110 Greenbriar Dr. Kalispell, Montana 59901

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Kyle M. Hanson, Robert A. Weaver, Jerry Simchuk and Raymon F. Thompson
Application No.	:	09/882,309 Confirmation No.: 7064
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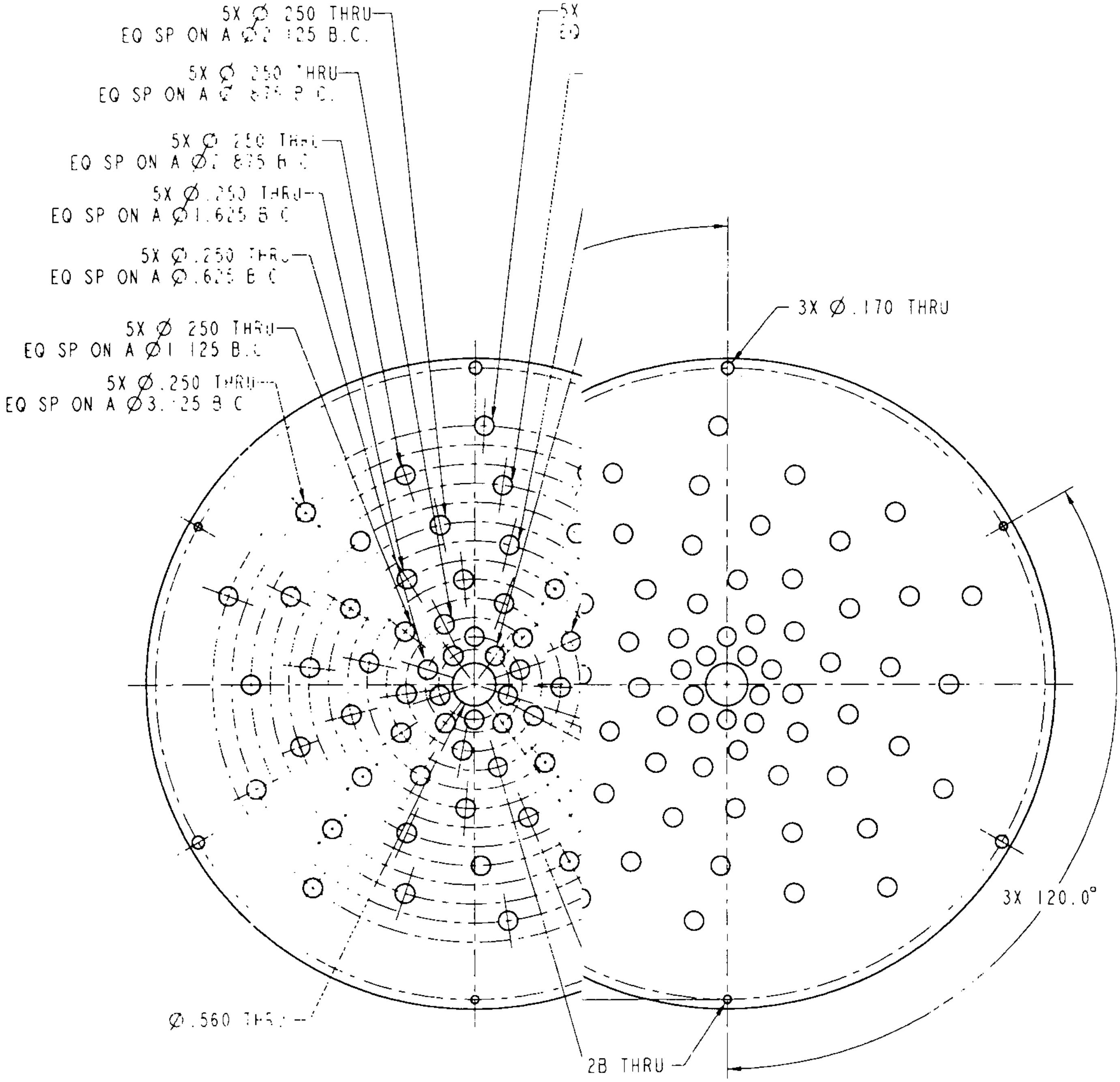
EXHIBIT A

REVISIONS			
DESCRIPTION	DISPOSITION (SCRAP, REWORK, USE AS IS)	DATE	APRVD



NOTE: TWO SETS OF FIVE SPIRAL HOLE PATTERNS EQUALLY SPACED.

TOLERANCES UNLESS NOTED
.XX = ±.020
.XXX = ±.010
ANGULARITY = ± .5°
BREAK CORNERS - .010 MAX
FILLET RADII - .015 MAX
MACHINED SURFACES
DIMENSIONS ARE IN INCHES
UNLESS NOTED

MATERIAL	NPP, SHEET 1/8"
FINISH	-
MODEL NO SHOWN	ATG0230

SEMITOOL™ KALISPELL, MT

DIFFUSER, SERIES 1

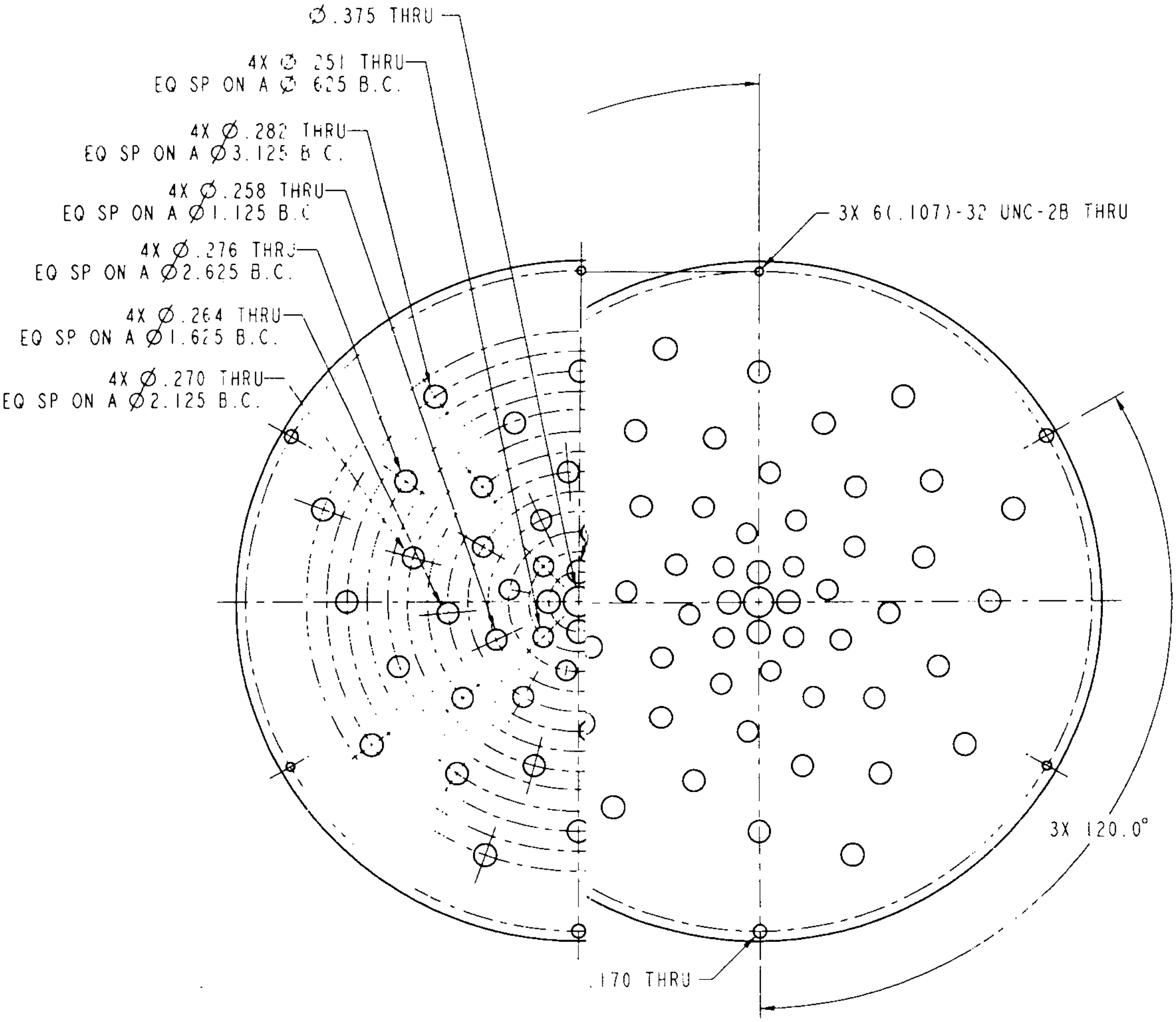
-

-

	JJE
	KMH

SIZE	FSCM NO	DWG NO	REV
B		ATG0230	
SCALE 0.500		SHEET 1 of 1	

REVISIONS			
DESCRIPTION	DISPOSITION (SCRAP, REWORK, USE AS IS)	DATE	APRVD



NOTE: TWO SETS OF FOUR SPIRAL HOLE PATTERNS EQUALLY SPACED.

MATERIAL	NPP, SHEET 1/8"
FINISH	-
MODEL NO SHOWN	ATG0231

SEMITOOL™ KALISPELL, MT

DIFFUSER, SERIES 2

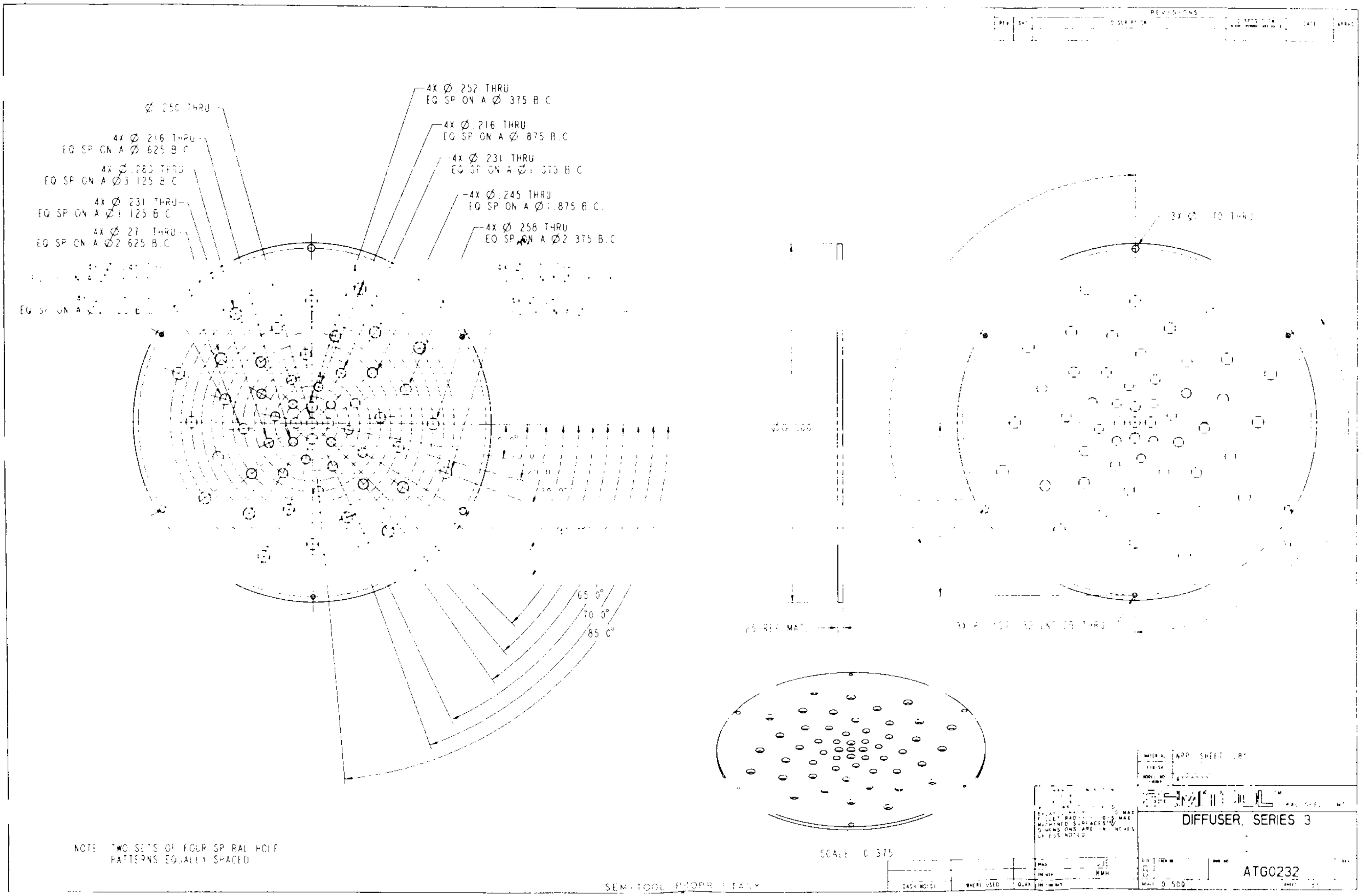
-

-

LERANCES UNLESS NOTED
X = ±.020
XX = ±.010
GULARITY = ±.5°
EAK CORNERS - .010 MAX
LET RADII - .015 MAX
CHINED SURFACES
MENSIONS ARE IN INCHES
LESS NOTED

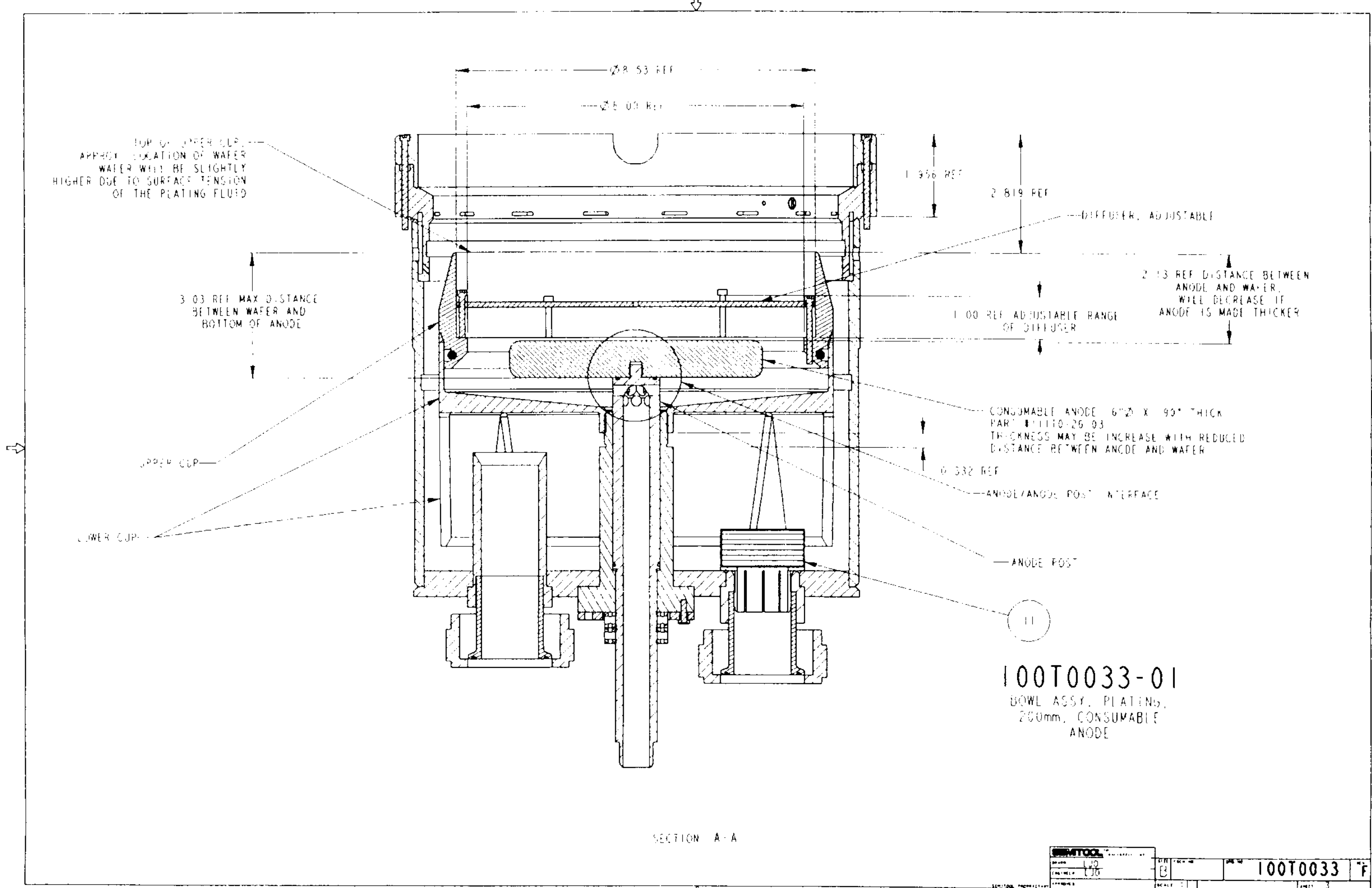
	JJE
	KMH
TION DATE	

SIZE	FSCM NO	DWG NO.	REV
B		ATG0231	
SCALE 0.500		SHEET 1 of 1	



NOTE: TWO SETS OF FOUR SPIRAL HOLE PATTERNS EQUALLY SPACED

SEMITOOL PROPRIETARY



100T0033-01

BOWL ASSY, PLATING, 200mm, CONSUMABLE ANODE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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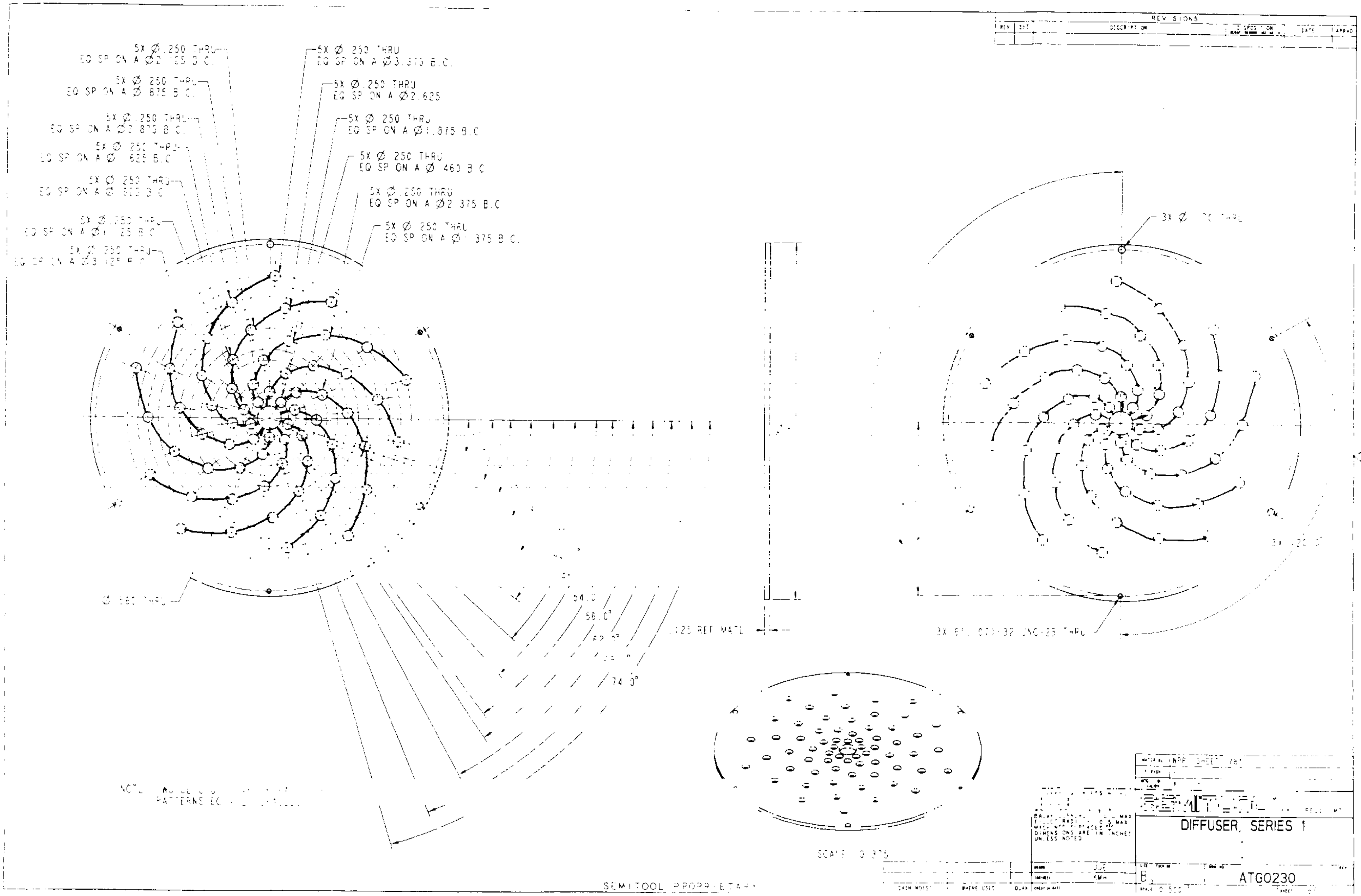
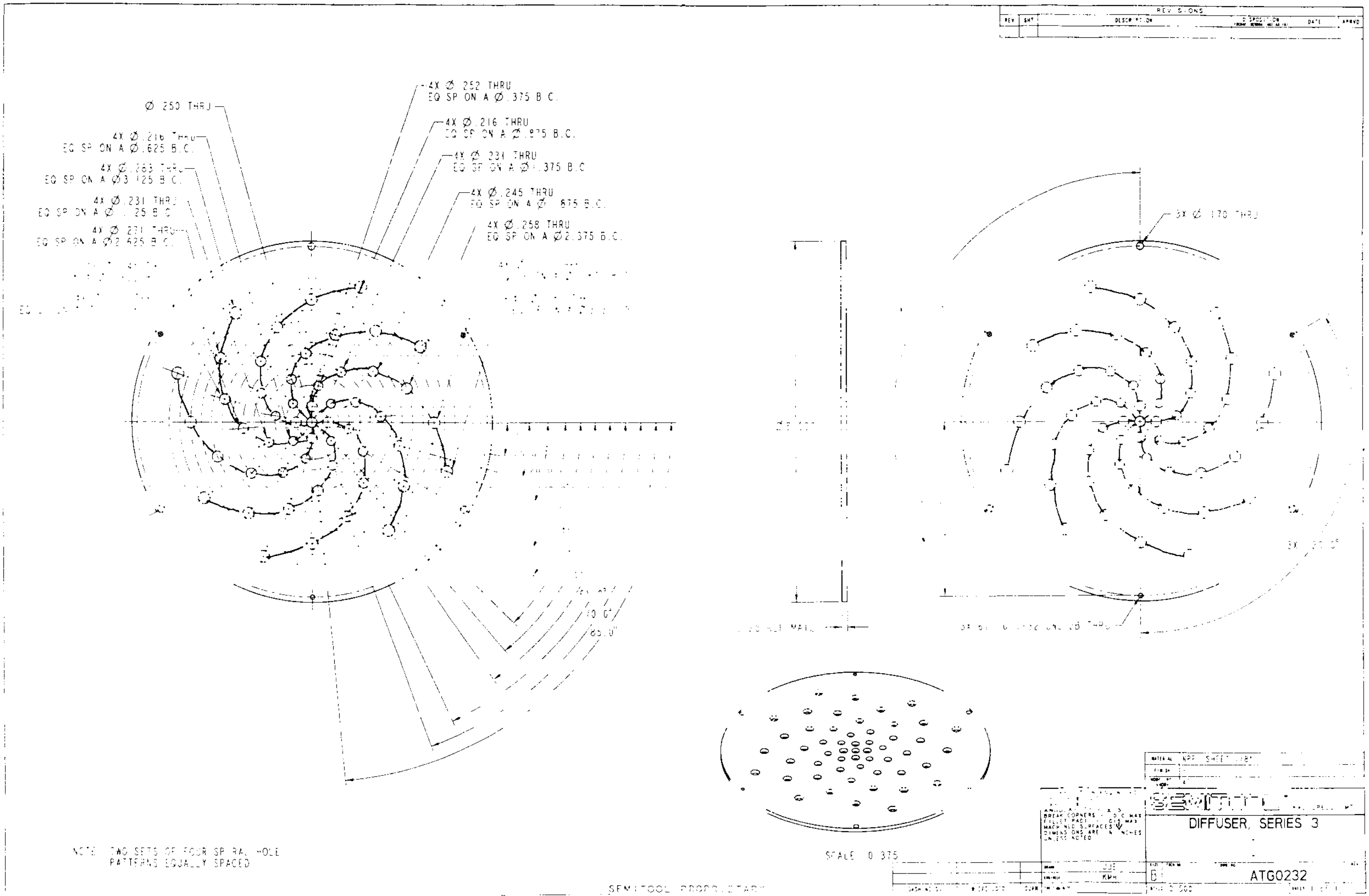
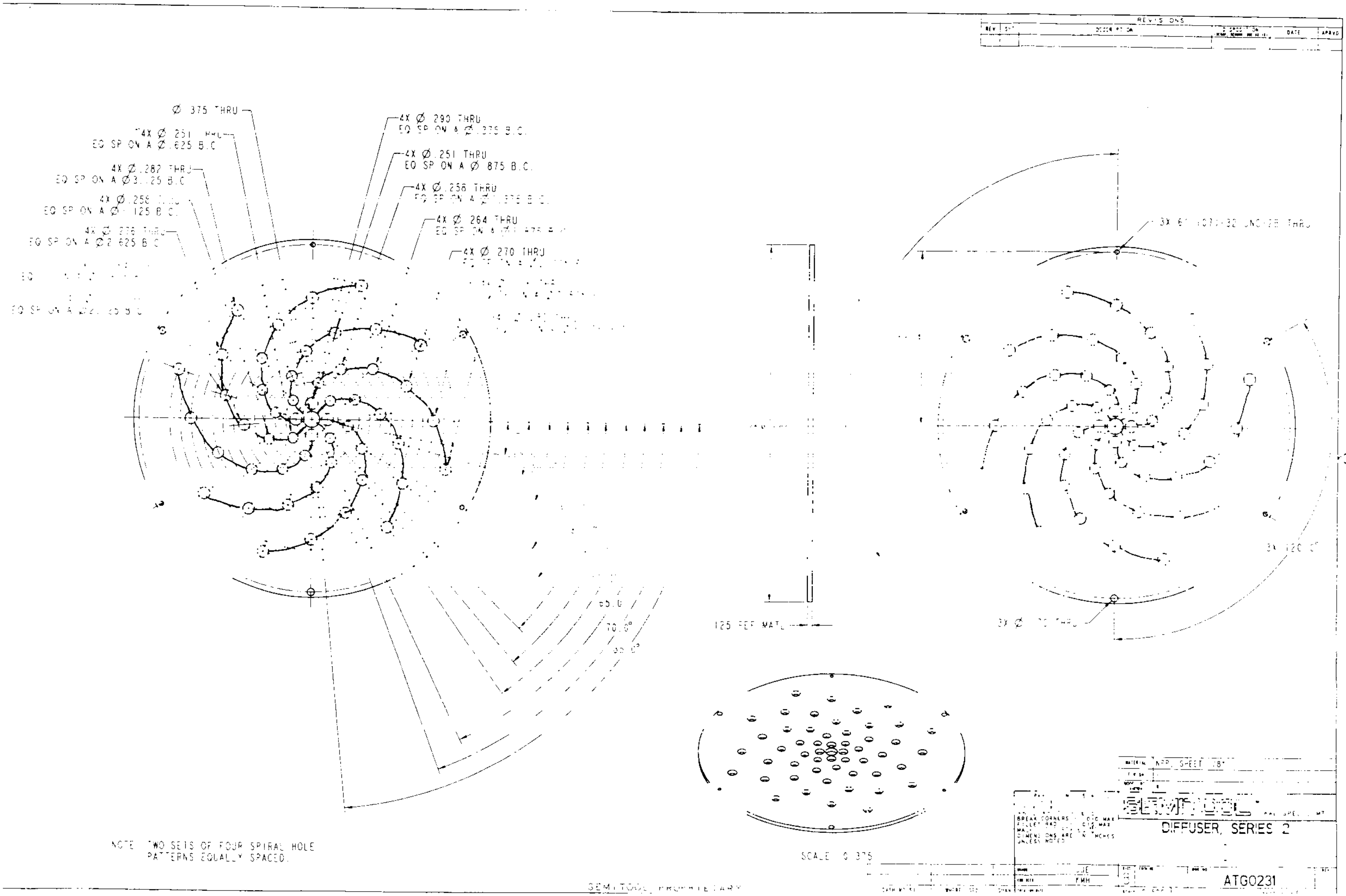
EXHIBIT B



REVISIONS
5X Ø .250 THRU
EQ SP ON A Ø3.375 B.C.
5X Ø .250 THRU
EQ SP ON A Ø2.625
5X Ø .250 THRU
EQ SP ON A Ø1.875 B.C.
5X Ø .250 THRU
EQ SP ON A Ø2.375 B.C.
5X Ø .250 THRU
EQ SP ON A Ø1.375 B.C.
54.0°
56.0°
74.0°
.125 REF MAT'L
SCALE
DIFFUSER, SERIES 1
B
ATG0230
SEMITOOL PROPRIETARY



REVISIONS
REV
SHT
DESCRIPTION
DATE
APPRVD
Ø .250 THRU
4X Ø .216 THRU EQ SP ON A Ø .625 B.C.
4X Ø .263 THRU EQ SP ON A Ø3.125 B.C.
4X Ø .231 THRU
4X Ø .231 THRU EQ SP ON A Ø2.625 B.C.
4X Ø .252 THRU EQ SP ON A Ø .375 B.C.
4X Ø .216 THRU
4X Ø .231 THRU
4X Ø .245 THRU
4X Ø .258 THRU EQ SP ON A Ø2.375 B.C.
10.0°
85.0°
3X Ø .170 THRU
NOTE: TWO SETS OF FOUR SPIRAL HOLE PATTERNS EQUALLY SPACED
SCALE 0.375
SEMITOOL PROPRIETARY
DIFFUSER, SERIES 3
ATG0232


Ø .375 THRU
4X Ø .251 THRU
EQ SP ON A Ø .625 B.C.
4X Ø .282 THRU
4X Ø .290 THRU
4X Ø .251 THRU
EQ SP ON A Ø .875 B.C.
4X Ø .256 THRU
4X Ø .264 THRU
4X Ø .270 THRU
3X Ø .120 THRU
3X 120.0°
65.0
70.0°
.125 REF MAT'L
SCALE 0.375
NOTE: TWO SETS OF FOUR SPIRAL HOLE PATTERNS EQUALLY SPACED.
SEMITOOL PROPRIETARY
REVISIONS
BREAK CORNERS
DIMENSIONS ARE IN INCHES UNLESS NOTED
FMH
DIFFUSER, SERIES 2
ATG0231

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Kyle M. Hanson, Robert A. Weaver, Jerry Simchuk and Raymon F. Thompson
Application No.	:	09/882,309 Confirmation No.: 7064
Filed	:	June 14, 2001
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EXHIBIT C

PROMETRIX OmniMap RS30

FRIDAY NOV 21, 1997 11:05

SEMITHERM PROCESS LAB
DISK ID: Semitherm SCALE: 1.000 PROBE ID: 10458

RAW DATA LISTINGS: CONTOUR MAP

TITLE: .5 IN OPEN AREA DIFFUSER FILE: 4898

TOTAL SITES: 121
GOOD SITES : 121
WAFER DIA. : 200.00 mm / 7.87 in
TEST DIA. : 184.00 mm / 7.24 in

MEAN : 13.24 m ohms/sq
STD DEV : 15.99 %
MINIMUM : 7.390 m ohms/sq
MAXIMUM : 15.46 m ohms/sq

WAFER ID. : D036A7 SLOT #21
LOT ID. : AMD (STI #363)
PROC. DATE : - -

CURRENT : MP/D 200.0mA 0.31mV
SORTING : 6.0 SIGMA

CIRCLE: 1

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
[illegible]	7.390m	-44.18									
2	8.416m	-36.43	4	8.320m	-37.16	6	8.348m	-36.94	8	8.364m	-36.82
3	8.385m	-36.64	5	8.291m	-37.37	7	8.343m	-36.98	9	8.391m	-36.62

CIRCLE: 2

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
10	10.30m	-22.20	14	10.27m	-22.43	18	10.30m	-22.20	22	10.33m	-21.97
11	10.35m	-21.82	15	10.26m	-22.50	19	10.28m	-22.35	23	10.34m	-21.90
12	10.31m	-22.12	16	10.25m	-22.58	20	10.33m	-21.97	24	10.40m	-21.45
13	10.33m	-21.97	17	10.25m	-22.58	21	10.37m	-21.67	25	10.39m	-21.52

CIRCLE: 3

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
26	12.88m	-2.719	32	12.61m	-4.758	38	12.50m	-5.589	44	12.65m	-4.456
27	12.68m	-4.229	33	12.57m	-5.060	39	12.56m	-5.136	45	12.71m	-4.003
28	12.76m	-3.625	34	12.54m	-5.287	40	12.63m	-4.607	46	12.72m	-3.927
29	12.66m	-4.380	35	12.50m	-5.589	41	12.64m	-4.531	47	12.55m	-5.211
30	12.57m	-5.060	36	12.47m	-5.815	42	12.66m	-4.380	48	12.70m	-4.078
31	12.65m	-4.456	37	12.50m	-5.589	43	12.71m	-4.003	49	12.83m	-3.096

CIRCLE: 4

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
[illegible]	[illegible]	9.743	58	14.69m	10.95	66	14.35m	8.383	74	15.00m	13.29
[illegible]	[illegible]	9.365	59	14.67m	10.80	67	14.47m	9.290	75	15.05m	13.67
52	14.72m	11.17	60	14.43m	8.987	68	14.72m	11.17	76	14.80m	11.78
53	14.86m	12.23	61	14.30m	8.006	69	14.86m	12.23	77	14.86m	12.23
54	14.78m	11.70	62	14.45m	9.139	70	14.81m	11.85	78	14.72m	11.17
55	[illegible]	8.459	63	14.62m	10.42	71	14.73m	11.25	79	15.07m	13.82
56	[illegible]	[illegible]	64	14.68m	[illegible]	72	14.66m	10.72	80	15.06m	13.74
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CIRCLE: 5

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
82	13.96m	5.589	92	14.83m	12.00	102	14.05m	6.117	112	15.39m	16.23
83	13.86m	4.682	93	14.97m	13.06	103	14.12m	6.646	113	15.33m	15.78
84	14.53m	9.743	94	14.79m	11.70	104	14.95m	12.91	114	15.30m	15.55
85	15.03m	13.51	95	14.12m	6.646	105	15.27m	15.33	115	14.54m	9.818
86	15.07m	13.82	96	13.70m	3.474	106	15.46m	16.76	116	14.49m	9.441
87	14.96m	12.99	97	14.45m	9.139	107	15.39m	16.23	117	14.72m	11.17
88	14.61m	10.34	98	14.98m	13.14	108	14.97m	13.06	118	14.96m	12.99
89	14.07m	6.268	99	15.17m	14.57	109	14.79m	11.70	119	15.03m	13.51
90	14.14m	6.797	100	15.10m	14.04	110	14.60m	10.27	120	14.99m	13.21
91	14.74m	11.32	101	14.69m	10.95	111	15.13m	14.27	121	14.67m	10.80

PROMETRIX OmniMap RS30

FRIDAY NOV 21, 1997 09:24

SEMITHERM PROCESS LAB
DISK ID: Semitherm SCALE: 1.000 PROBE ID: 10458

RAW DATA LISTINGS: CONTOUR MAP

TITLE: .5 IN OPEN AREA DIFFUSER TAST WAFER FILE: 4897

AMD LOT 363

TOTAL SITES: 49
GOOD SITES : 49
WAFER DIA. : 200.00 mm / 7.87 in
TEST DIA. : 184.00 mm / 7.24 in

MEAN : 13.35 m ohms/sq
STD DEV : 15.23 %
MINIMUM : 7.413 m ohms/sq
MAXIMUM : 15.44 m ohms/sq

WAFER ID. : D036A7 SLOT #21
LOT ID. : AMD (STI #363)
PROC. DATE : - -

CURRENT : MP/D 200.0mA 0.31mV
SORTING : 6.0 SIGMA

CIRCLE: 1

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
[illegible]	7.413m	-44.47									
[illegible]	[illegible].726m	-27.14	4	9.626m	-27.89	6	9.686m	-27.44	8	9.687m	-27.43
[illegible]	[illegible]66m	-27.44	5	9.590m	-28.16	7	9.691m	-27.40	9	9.723m	-27.16

CIRCLE: 2

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
10	13.59m	1.797	14	13.36m	.0749	18	13.23m	-.8989	22	13.50m	1.123
11	13.44m	.6742	15	13.24m	-.8240	19	13.28m	-.5243	23	13.57m	1.647
12	13.36m	.0749	16	13.25m	-.7491	20	13.46m	.8240	24	13.43m	.5993
13	13.26m	-.6742	17	13.24m	-.8240	21	13.49m	1.048	25	13.41m	.4494

CIRCLE: 3

SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV	SITE	VALUE	%DEV
[illegible]	14.[illegible]m	[illegible]	[illegible]	14.97m	11.38	38	14.09m	5.543	44	15.43m	15.58
[illegible]	14.42m	6.[illegible]15	33	14.95m	11.98	39	14.82m	11.01	45	15.27m	14.38
[illegible]	15.15m	13.43	34	14.03m	5.093	40	15.37m	15.13	46	14.58m	9.213
[illegible]	15.[illegible]1m	12.4[illegible]	35	14.49m	8.539	41	15.44m	15.65	47	14.77m	10.63
[illegible]	14.07m	5.[illegible]3	36	15.13m	13.70	42	14.72m	10.26	48	15.12m	13.25
[illegible]	14.47m	8.[illegible]9	37	15.07m	12.88	43	14.87m	11.38	49	14.94m	11.91

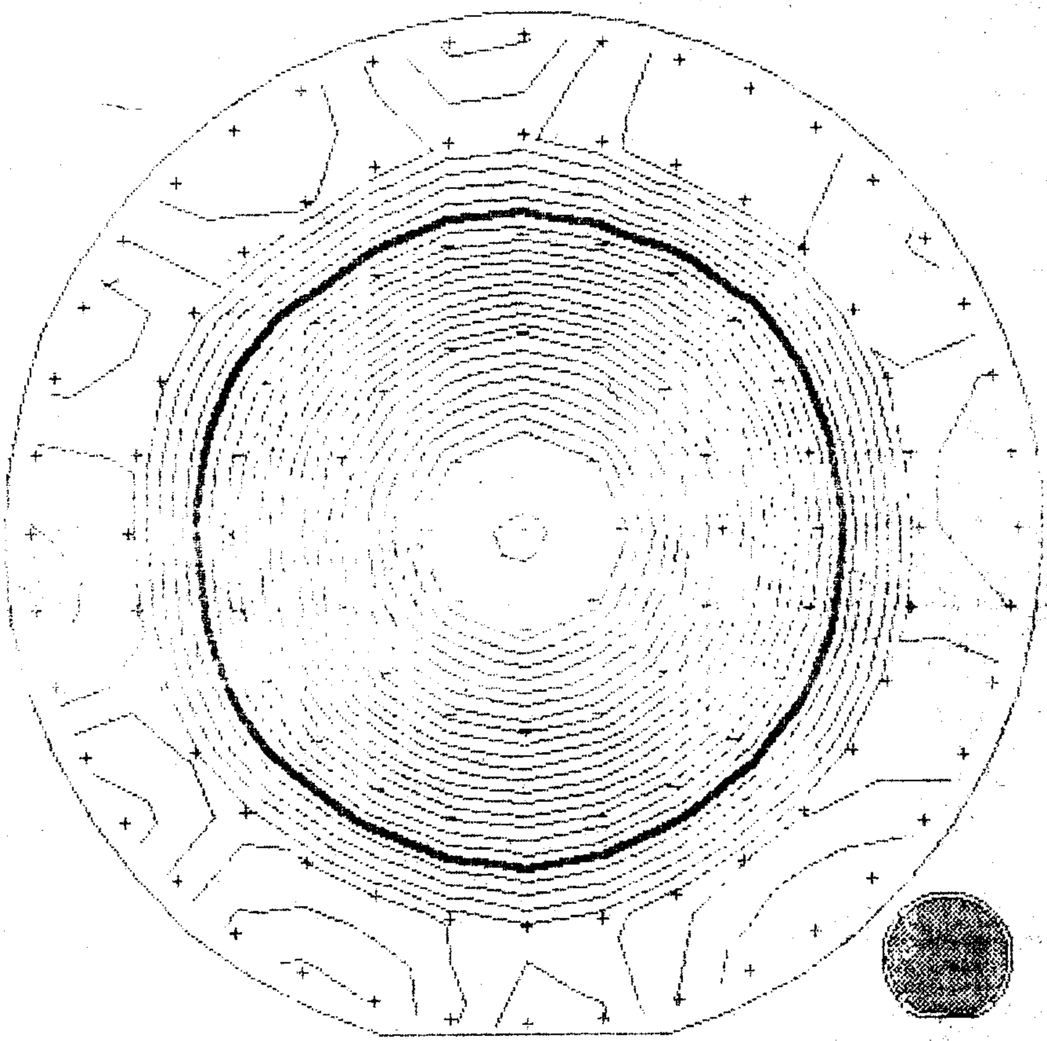
PROMETRIX OmniMap RS30

FRIDAY NOV 21, 1997 09:37

SEMITHERM PROCESS LAB

DISK ID: Semitherm

SCALE: 1.000 PROBE ID: 10458



TITLE: .5 IN OPEN AREA DIFFUSER

FILE: 4898

TOTAL SITES: 121
GOOD SITES : 121
WAFER DIA. : 200.00 mm / 7.87 in
TEST DIA. : 184.00 mm / 7.24 in

WAFER ID. : D036A7 SLOT #21
LOT ID. : AMD (STI #363)
PROC. DATE : - -
TEMPERATURE: 22.92C

MEAN : 13.24 m ohms/sq
STD DEV : 15.99 percent
MINIMUM : 7.390 m ohms/sq
MAXIMUM : 15.46 m ohms/sq

INTERVAL : 2.00 percent
CURRENT : MP/D 200.0mA 0.31mV
SORTING : 6.0 SIGMA